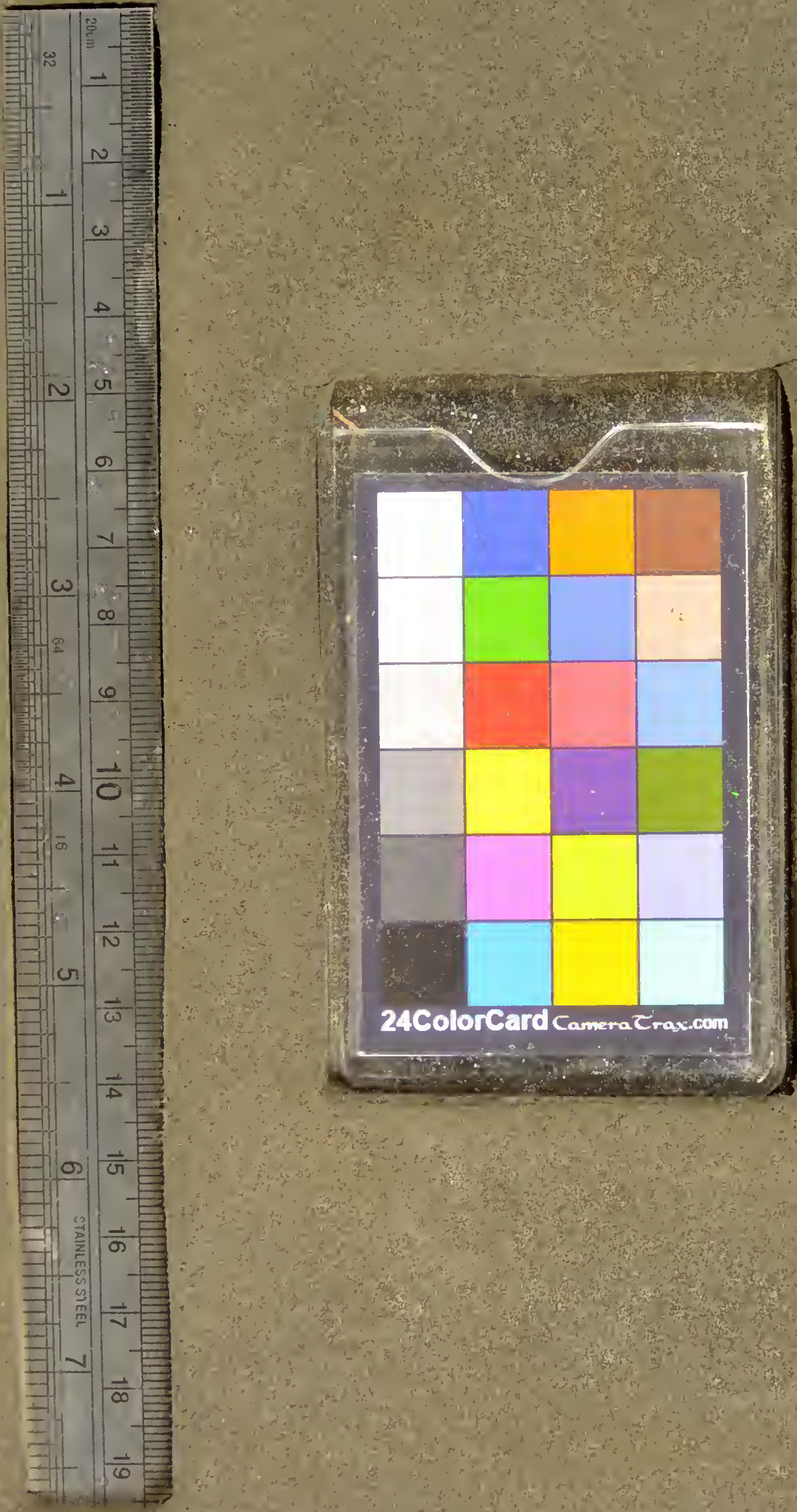
24ColorCard
CameraTrax.com
STAINLESS STEEL

21965389
T 5.36

# PARALYSIS OF THE SIXTH AND SEVENTH CRANIAL NERVES.

By G. A. GIBSON, M.D., D.Sc.

*Reprinted from the* Edinburgh Medical Journal. *Edinburgh and London*, Young J. Pentland, *November*, 1898.

# PARALYSIS OF THE SIXTH AND SEVENTH CRANIAL NERVES.

By G. A. GIBSON, M.D., D.Sc., *Senior Assistant Physician, Royal Infirmary, Edinburgh.*[1]

(PLATE V.)

IN order to illustrate the application of the facts of anatomy, physiology, and pathology to clinical medicine, there could be no better instance than the case now before you. It is that of a laundress, æt. 49, admitted to Ward 27 on account of chronic bronchitis. Her father is said to have died about the age of 60, from an ulcer of the stomach, which may possibly have been a malignant affection; her mother, at the age of 59, of dropsy. She believes she has one brother alive. Two brothers are dead, one having died of fever in South Africa, and the other from some form of paralysis due to brain disease. Her social surroundings have not been by any means satisfactory; she has had no fixed home for a long time, but has lived lately in the Salvation Army Shelter. Previous to the bronchial affection for which she sought advice, she has had no serious illness—so far as we know—for a long period. When about twelve months old she was playing one day on the floor, and her mother suddenly noticed a change in her appearance. From that time there has been loss of power over the right side of her face, without any affection of that side of the body, the face alone being involved. She has since then, but still long ago, had several illnesses, including measles, bronchitis, and smallpox. There has been, moreover, rheumatic pains in her knees, and in her side, as well as several other minor aliments, which do not require any particular note.

Confining ourselves to-day to the nervous system, let me briefly state that there is absolutely no change in the sensibility of any part, tested in every way. With regard to the motor functions, there is complete paralysis of the muscles of the right side of the face; that is to say, every branch of the facial nerve, so far as we can make out, is deprived of its functions. Many of the symptoms produced in consequence of this affection may be seen at a glance; certain of them, however, require careful search.

The right side of the forehead is much more youthful than the left, being marked by no lines of thought, whereas on the left side there are very distinct furrows; near the middle line they are visible on the left, but not on the right side. The right eye is more widely open than the left, by reason of drooping of the lower eyelid, over which the tears trickle, in consequence of the failure of the lid, with its duct, to rest on the globe. The nose is slightly, and the mouth considerably, deflected towards the left side; the upper lip, further, on the right side hangs over its corresponding lower fellow. These are facts which the most superficial observer could not fail to take note of, and they are present when the face is entirely in repose, as may be seen in Plate V.

---

[1] Part of a Clinical Lecture delivered in the Royal Infirmary.

If such symptoms are obvious while the face is at rest, they become almost dramatic in their intensity when the muscles of expression are brought into action. When the patient attempts to shut her eyes the left can be firmly closed, but the right remains open, and the sole result is that, in popular phraseology, she "turns up the white" of this eye. On asking her to show her teeth, the left half of the upper lip alone is elevated. She has never acquired the art of whistling, but is a willing novice; when she is requested to make the attempt, she merely puffs out her right cheek, and the air escapes through the weakened lips on that side. As she has never learned the accomplishment—if it may so be called—of moving her ears, it is impossible by simple inspection to say whether she has lost control of that of the right side. On looking into the mouth with the view of examining the muscles of the palate, it cannot be decided whether there is any difference between the two lateral arches of the veil, and, so far as can be discovered, the uvula hangs vertically. Since the sense of taste is of the greatest importance in the localisation of facial lesions, it is necessary to investigate it with the greatest care, and in doing this the tests employed must be sapid, yet odourless, so that, while the gustatory nerves are stimulated, the olfactory are not excited. On applying salt, quinine, and other inodorous substances to the anterior part of the right side of the tongue, our patient immediate gives a correct response, in so far as she is familiar with the taste of the substance, to a question as regards its nature. Since the patient has enjoyed no opportunity of being trained in æsthetic matters, and is, moreover, by no means of an observant character, it is not in our power to ascertain if she appreciates musical sounds better with one ear than the other, but there is no doubt of the fact that she can hear ordinary sounds more distinctly with the left ear. As the point is one of real importance, the patient has been kindly examined by Dr. M'Bride, who reports that, while a watch, normally audible at 30″, is heard by the right and left ears at 5″ and 15″ respectively, the tuning-fork is heard at 12″ and 8″. This shows that the stapedius is almost certainly affected.

To sum up succinctly the groups of muscles which are affected will render the determination of the site of the lesion—the anatomical diagnosis—easier. All the muscles of expression, in short the whole of the muscles of the face, are paralysed, including the orbicularis palpebrarum and the orbicularis oris, both of which will merit particular attention. We must not lay stress upon the condition of the palatal muscles, but there is greater intensity of hearing musical notes on the right side, and by the use of electricity it is easy to ascertain that the retrahens aurem and the anterior part of the digastric muscle are paralysed. The sense of taste is intact.

But over and above all these paralytic phenomena, there is another symptom which came upon me, when examining the patient, as a surprise. When she looks to the right, the eye of that side does not move, but when she looks to the left, upwards or downwards, it turns quite naturally in those directions. This throws an interesting light on the localisation of the lesion, since we must account in the diagnosis for the fact that the external rectus is paralysed.

With regard to the general facts of facial paralysis, it is necessary in the first place to bring before you the consideration, that it may take its origin in any part of the motor centres or motor tracts which innervate the face.

The first great distinction is with regard to paralysis caused by a lesion of any part of the facial tract above the nucleus; that is to say, from the region of the cortical representation down to the nucleus itself. Cases of supranuclear paralysis of the face are distinguished, in the first place, from any one situated further down, by the condition of matters connected with the eye. In the present case, as you have seen, the orbicularis palpebrarum is paralysed, and that fact tells us at once that the seat of the lesion must not at any rate be higher up than the nucleus. It may be nuclear or it may be in the facial nerve; it is usually called peripheral, but it is better to call it nuclear or infra-nuclear—whichever it may be—as opposed to supra-nuclear, where the seat of the lesion is above the nucleus. When facial paralysis is seen along with hemiplegia, where the patient has lost power over the leg and the arm, there is paralysis of the muscles of the lower part of the face, while the upper part of the face escapes. The orbicularis palpebrarum is not paralysed, and the patient can close the eye on the affected side; further, the frontalis is not affected, so that there is no fading out of the lines upon the forehead.

Broadbent wrote a celebrated paper on this point. Hilton Fagge had previously read a communication on this subject in 1860 or 1861 before the Physical Society of Guy's Hospital,[1] bringing forward the same facts which Broadbent stated, but Fagge's paper was never published, and the priority of recording the observation therefore remains with Broadbent.[2] In muscles which usually act together on the two sides of the body, and which have a bilateral innervation, a single central cause does not produce unilateral paralysis. This is, putting it as simply as possible, "Broadbent's Law." The eyelids are innervated from both sides of the brain, and if there be a solution of continuity of the tract of one side, it does not cause complete paralysis of the other side. The patient cannot, indeed, wink with the eye on the affected side, because there is no power of determining unilateral impulses from the side of the brain in which the supra-nuclear lesion is situated, yet both eyes can be closed simultaneously by the influence of the other side. There is another great distinction besides this, dependent upon the state of the muscles. In a case of paralysis, caused by a lesion above the nucleus, there is no interference with the nutrition of the muscles, by which is meant, not that there may not in the long run be a change in these, but that there is no immediate trophic change; whereas, in the case of paralysis affecting the nuclear or infra-nuclear region, there is rapid wasting. Closely associated with this consideration is the important difference as regards electrical reactions. In supra-nuclear lesions there is no reaction of degeneration; in paralysis from lesions in or below the nucleus this phenomenon is present.

---

[1] "Principles and Practice of Medicine," London, 1886, vol. i. p. 485.
[2] *Brit. and For. Med.-Chir. Rev.*, London, 1866, vol. xxxvii. p. 468.

Passing down to the trunk of the nerve, if there be any lesion above the geniculate ganglion, there is paralysis of the whole of the muscles of the face, including the orbicularis palpebrarum, the orbicularis oris, and the frontalis and digastric muscles, as well as those of the ear, along with the increased intensity of sounds, correctly explained by Lucae[1] as due to paralysis of the stapedius muscle, but there is no implication of the sense of taste.

In the case of a lesion of the nerve at the geniculate ganglion, it was at one time a great tradition of the Edinburgh school that there was paralysis of the soft palate, because, on the authority of Sanders,[2] who popularised the view to all English readers, it was believed that the palatal muscles were rendered useless. It used to be taught that the innervation of the elevating fibres of the palate was from the seventh, derived through the great superficial petrosal, and only in recent years has the view that the palate is supplied in this way been altogether refuted. The palate receives its supply by the vago-glosso-pharyngeal nerves from the nucleus ambiguus, as has been proved by Turner and Bulloch.[3] We must therefore regard paralysis of the palate as having nothing at all to do with any affection of the facial nerve.

Proceeding downwards, the next point is that, if there be an affection anywhere below the geniculate ganglion, there is a loss of the sense of taste over the anterior two-thirds of the tongue.

Now it is my duty to bring before you very briefly some recent observations bearing upon the relations of these nerves to each other. The orthodox view is that the chorda tympani, apart from its secretory functions, is a sensory nerve. It accompanies the lingual nerve for a certain distance, and then pursues an individual course, till it reaches the Fallopian aqueduct, where it becomes related to the facial nerve. You have probably, in your anatomical studies, seen it in the aqueduct as it passes up, and you have no doubt been taught physiologically to believe that it leaves the facial nerve again at the geniculate ganglion, follows a course forward, so as to pass into the second division of the fifth, along which it goes to its centre. If that be true, the nerve is without question one of the most complicated in the body. There are a great many facts which support this view, but some throw a certain amount of doubt on it. It is not part of our duty to shirk difficulties, but rather to try to solve them, and some of these must be brought before you.

---

[1] *Berl. klin. Wchnschr.*, 1874, S. 163.
[2] *Edin. Med. Journ.*, 1865, vol. xi. p. 141.
[3] *Brain*, London, 1894, vol. xvii. p. 706.

Points in favour of this hypothesis are, that there is a large number of cases now in which disease solely of the fifth nerve has caused a loss of the sense of taste in the anterior two-thirds of the tongue. Gowers[1] describes an interesting example of such cases, and they can only be explained on the present hypothesis; the case narrated by Ferguson[2] of exostosis, pressing upon the Vidian nerve and producing absolute loss of taste over the anterior two-thirds of the tongue, is strongly in its favour; some cases described by Fedor Krause[3] are, nevertheless, antagonistic to this view, if there is no loophole of escape. In some cases in which, on account of trigeminal neuralgia, the fifth nerve has been entirely removed, it has been found that the sense of taste has persisted. If this be so, it is extremely difficult to explain from these phenomena, as contrasted with the more usual results, how the disease of the fifth nerve abolishes the sense of taste in the anterior two-thirds of the tongue. Further, against this view are the embryological researches of Dixon, who has found that the chorda tympani takes its origin without a doubt as a branch of the facial nerve. It therefore is embryologically to be looked upon, according to Dixon,[4] as an appanage of the facial nerve; he further urges that the geniculate ganglion is truly a ganglion. If it be so it must have some sensory nerve, and, if the chorda tympani be not a sensory nerve belonging to the system, the ganglion diverges from the usual plan. These are the great facts against the current view. Certain writers have tried to find a way out of the difficulty, by suggesting that in different individuals the taste fibres take different courses. This may be true, for there are minor diversities in the distribution of nerves, just as there are in the distribution of vessels; that there should be individual variations of such colossal proportions, as that the sense of taste should sometimes pass upwards by the seventh, and sometimes by the fifth, is nevertheless so incredible that we must put it out of court altogether. We must at present follow in the footsteps hallowed by the teachers of the past, although regarding the view of Dixon with much interest, and hoping that in the future the question may be definitely settled.

---

[1] *Edin. Med. Journ.*, 1897, N.S., vol. i. p. 37.
[2] *Med. News*, Phila., 1890, vol. lvii. p. 395.
[3] "Die Neuralgie des Trigeminus," Leipzig, 1896, S. 89.
[4] *Edin. Med. Journ.*, 1897, N.S., vol. i. p. 395.

Another vexed question must also come before you. The orbicularis oris is commonly believed to receive its nerve supply from the hypoglossal nucleus, or that of the twelfth nerve, as is stated by Gowers,[1] for example, but it is certain that the fibres run in the course of the seventh, wherever they arise. This view is far from being universally held, and from the results of microscopic investigation it is combated by Dr. Alex. Bruce, who in a communication recently made at the Pathological Club, but not yet published, gives good reasons for holding our judgment in suspense. This patient has complete paralysis of the orbicularis oris, which forms one of the difficulties which we shall have to face in reaching the localisation of the lesion.

In addition to the various symptoms of facial paralysis, you remember that she also suffers from loss of power of the external rectus of the eye on the same side. This means that there is a lesion, either of the nucleus, or of the trunk of the sixth—the abducent nerve. In this connection let me bring before you diagrammatically the relations of the different oculomotor nerves. In the first place, let us look at the third nerve nucleus, which is split up into several subdivisions. At the superior end there is the nucleus which appears to innervate the muscles of accommodation, followed by that which supplies the circular muscle of the iris; to those succeed, in the order following, those which pass to the internal rectus, the superior rectus, the inferior rectus, and the inferior oblique. It is very interesting to note that those muscles which work together have their nuclei close together; for instance, the inferior rectus and inferior oblique are commonly in co-operation, and very frequently also the internal rectus and the superior rectus. Passing a little further down, but still in the region of the Sylvian aqueduct, is the nucleus of the fourth.

In front of the acoustic tuberculum lies the nucleus of the sixth nerve. It is situated immediately below the motor root of the fifth, and at the same level as, but a little superficial to, the sensory nucleus of that nerve. The nucleus of the seventh, which lies somewhat lower down and at a deeper level than that of the sixth, with the long sensory root of the fifth intervening, has its fibres curving first upwards and backwards towards the floor of the fourth ventricle, then forwards and downwards, so as practically to embrace the sixth nucleus. These points will help us in the anatomical arguments. They are shown in Fig. I., which is based upon one given by Brissaud.[2]

Having now brought before you every fact bearing on the condition of the patient, it is necessary to sum up the various

---

[1] "Diseases of the Nervous System," London, 1888, vol. ii. p. 276.

[2] "Leçons sur les maladies nerveuses," Paris, 1895, p. 371.

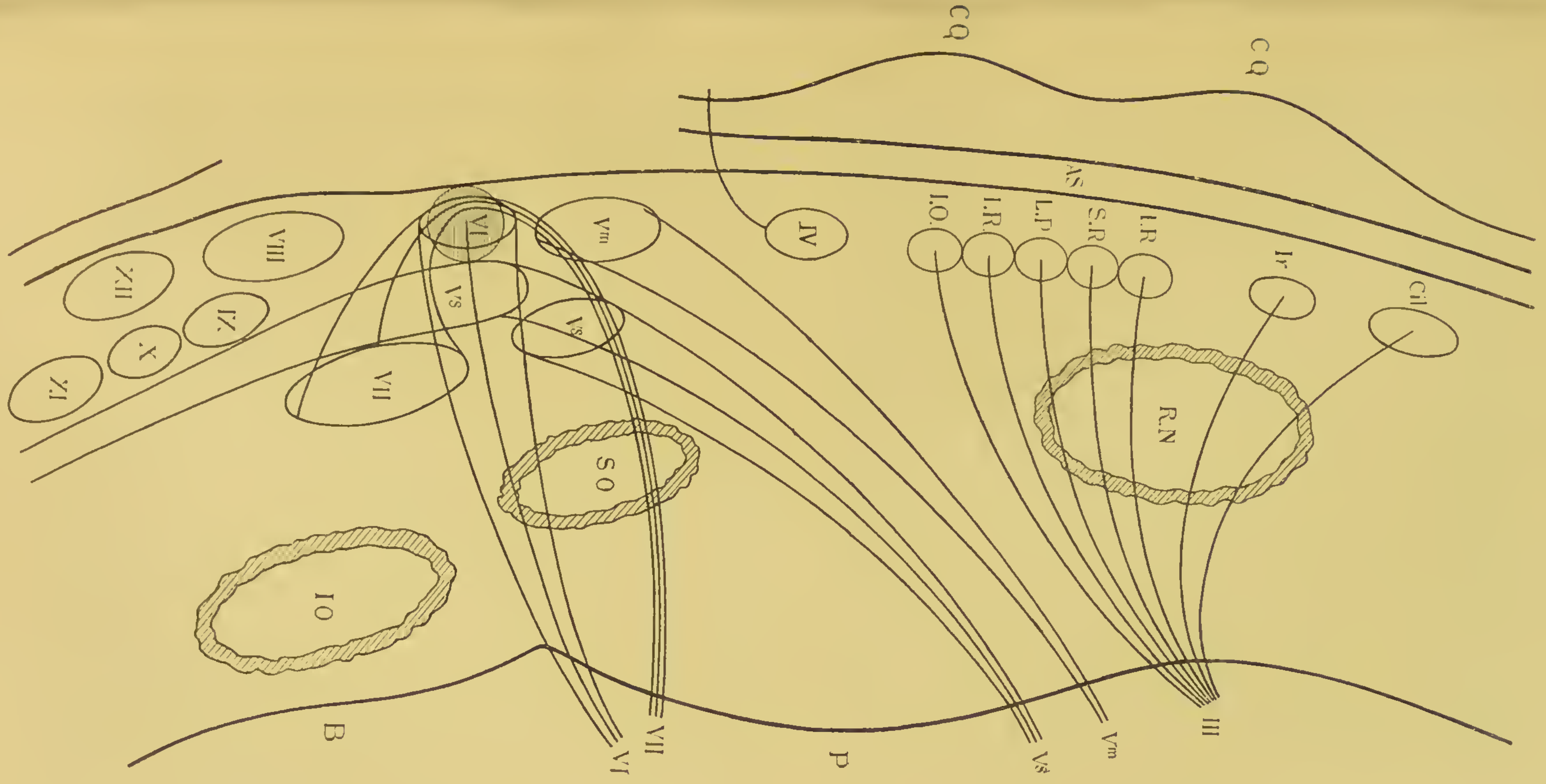

Fig. 1.—Diagram of the positions of the nuclei of the oculo-motor nerves and their connections. CQ, corpora quadrigemina ; P, pons ; B, bulb ; RN, red nucleus ; SO, superior olive ; IO, inferior olive ; Cil, special division of third nucleus for the ciliary muscle ; Ir, for the constrictor pupillæ ; IR, for internal rectus ; SR, for superior rectus ; LP, for levator palpebræ ; IR, for inferior rectus ; IO, for inferior oblique ; IV, nucleus of fourth ; $V^m$, motor, and $V^sV^s$, sensory nuclei of fifth ; VI., VII., VIII., IX., X., XI., and XII., nuclei of remaining bulbar nerves. The dark shaded circle marks the site of a possible lesion.

points which can help us to a definite conclusion. From the different symptoms present, it must be clear to you that the facial lesion must be either nuclear or infra-nuclear, on account of the state of the orbicularis palpebrarum. If the current view regarding the supply of the orbicularis oris is correct, the lesion cannot be nuclear; it must be lower down, after the hypoglossal twig has joined it. It must, notwithstanding, be situated above the origin of the nerve to the stapedius muscle. Then, as the sense of taste is unaltered, the lesion must be above the geniculate ganglion. But the paralysis of the sixth nerve must also be reckoned with. Acting upon the principle of Newton, we invariably attempt to find one cause which will account for all the phenomena of any case. There are two positions in which one lesion might cause the double paralysis of the sixth and seventh nerves. There may have been an affection of the nucleus of the former, affecting the fibres of the latter as they pass round it, as shown in Fig. I. Such a lesion, although far from common, is nevertheless well known. It resembles an acute anterior polio-myelitis of the cord lower down. On the other hand, there may have been a lesion affecting the trunks of both nerves as they pass along the base of the brain. Although by no means very close to each other, they are not so remote but that one morbid process might affect both. There are no facts to determine which is the more likely affection. With regard to the anatomical diagnosis, nothing further remains to be said.

As to the pathological diagnosis, let me briefly refer to the fact that there are a great many different causes of facial paralysis. In supra-nuclear cases there are all the vascular lesions of the brain. Hæmorrhage, embolism, thrombosis—any one of these three may cause that form of paralysis. A tumour growing within the brain, affecting it in that region, may cause facial paralysis of the lower part of the face; and an abscess, even taking its origin in the middle ear, may cause similar changes, leading to that form which has been called supra-nuclear. The nucleus may be involved in anterior polio-myelitis; the trunk may be interfered with by any lesion of the base of the brain; in consequence of bone disease, the facial trunk below the nucleus may suffer, or the endings of the nerve going to their peripheral distribution may be affected. In the case before us the lesion must have been an affection of the nucleus of the sixth, of an acute nature, affecting the facial fibres passing round it, or some meningitic lesion of the base of the brain.

In regard to the future of such cases as this, in which the facial nerve may be assumed to be destroyed, the prognosis is absolutely hopeless. In cases of peripheral facial paralysis the prognosis is usually quite good. After a few days or weeks, the patient is entirely restored to health. If the paralysis does not pass off in a few weeks, it is not usually peripheral; it is probably due to some lesion within the bone.

With respect to treatment, no methods will be of any avail in such a case as this, except to avert some of the consequences following upon the paralysis, particularly the proneness to inflammation of the eye.